

Hatchery Risk Assessment Project

What Is It?

The goal of this project is to develop a risk assessment tool for hatcheries that is consistent, transparent, and scientifically defensible. The focus is on biological risks to natural production, including risk to hatchery fish that are part of a conservation strategy for natural production. Risk is the set of outcomes associated with a hazard (source of loss) that have different consequences and probabilities of occurring.

Hatcheries pose four general kinds of hazards to natural populations—genetic, ecological, demographic, and facility—with different components (Figure 1). Our objective is to develop a separate assessment tool (or module), such as a causal probabilistic network (Figure 2), for each of these components that quantifies as much as possible the risks associated with each under different conditions.

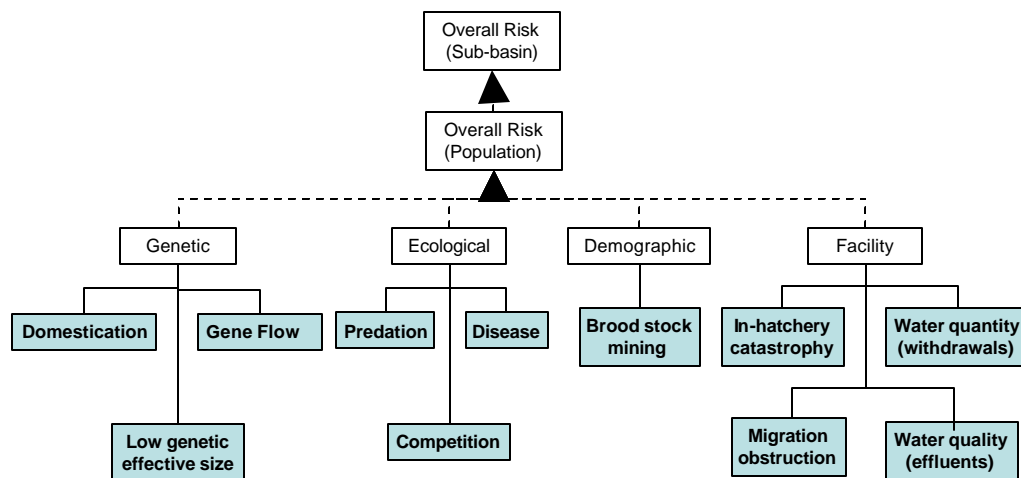


Figure 1. One possible organization of hatchery hazards. Shaded boxes are potential risk modules. Dotted lines show the roll-up of risks from all hazards to an overall risk for the population or sub-basin.

The consequences of these hazards can be measured in different ways, such as effects on abundance, fitness, or diversity. Ideally, we want to rollup the risks of each of these (i.e. take into account the interactions between the hazards) to an overall risk to the population or sub-basin, but developing this part of the tool may not be possible within the time-frame of this project.

Who Wants The Tool?

Western Washington treaty tribes, state, and federal agencies involved in managing hatcheries in the Columbia River and western Washington want an objective, transparent, rigorous tool for hatchery reform. The project was solicited by the Northwest Power Planning Council and is funded by Bonneville Power Administration.

Who Is Involved?

An important objective of this project is to represent the best available knowledge on these risks by including broad scientific participation. We have four key groups of participants. They are not mutually exclusive.

- *Principal Investigators*—Craig Busack, Ken Currens, Todd Pearsons, and Lars Mobrand are the principal investigators (PIs). They will do the bulk of the model development.
- *Advisory Group*—The advisory group consists of 10-12 scientists with 3-4 experts in each of the major kinds of hazards. Their role is to help the PIs identify the appropriate risk categories and sources of the risk the PIs wish to use (such as Figure 1), describe as influence diagrams or conceptual models the major factors influencing risk for each hazard, identify sources in the scientific literature of theoretical models that might be used, help with selection of the expert panel, and review the risk modules. Most of their participation will occur during three 2-day workshops.
- *Decision Theorists*—Two or three experts in decision theory, causal probabilistic networks, and expert elicitation help review the overall approach of the project.
- *Expert Panel*—This group includes 25-30 experts, including some members of the Advisory Group, who will be a source of expert knowledge on risk parameters when the scientific literature is inadequate. Expert elicitation will use the Internet.

When Does It Start?

The project starts in January 2004. The advisory group meets with the principal investigators in February and again in April and will receive regular updates on the project. Survey of the expert panel occurs during the summer. The advisory group meets again in September to review the final modules and report.

How Long Will It Take?

The project will be completed by November 2004.

Whom Do I Contact for More Information?

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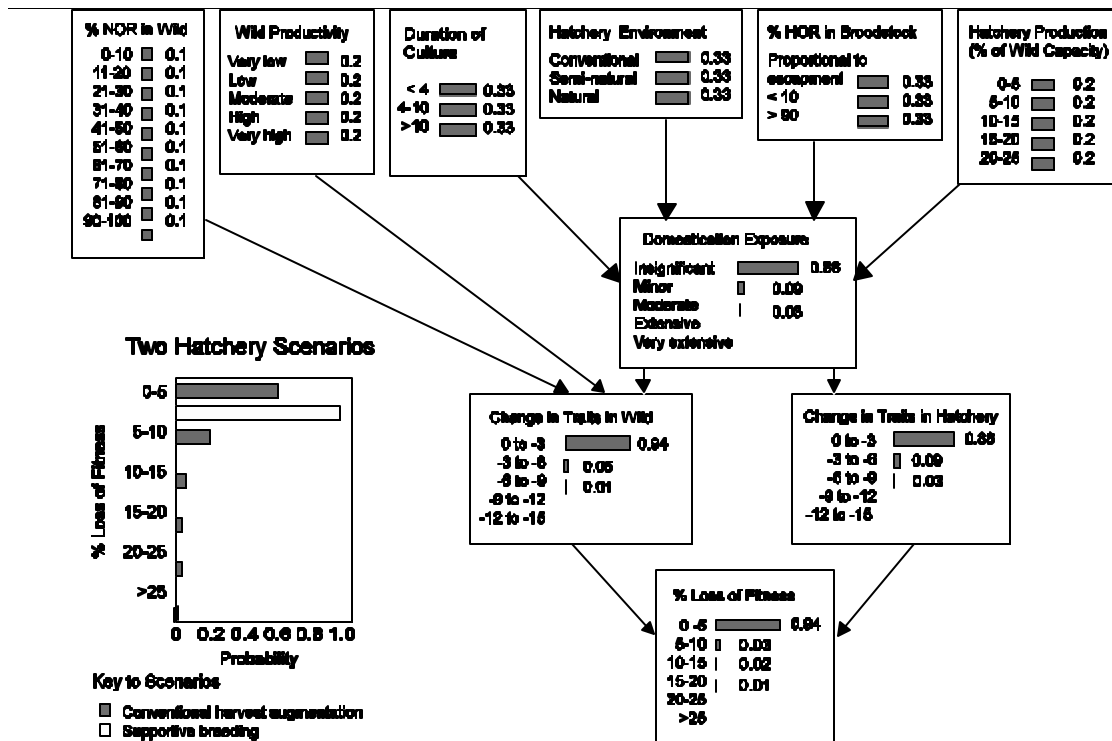


Figure 2. A causal probabilistic network for loss of fitness from domestication and risk assessment results from two hatchery scenarios (inset). The causal probabilistic network links different states of input variables (top row), dependent population variables, and risk outcomes through tables of probabilities developed from simulations, data, and expert knowledge. The histograms in the network show the initial probabilities before assessment. Inset histogram (lower left) shows probabilities for loss of fitness after assessment. The conventional harvest augmentation scenario assumed proportion of natural-origin recruits (% NORs) spawning in the wild was 41-50%; productivity in the wild was moderate; the program has been operating for 4-10 generations; the conventional hatchery environment was almost entirely artificial; more than 90% of brood stock was of hatchery origin (% HORs); and hatchery production was more than 20% of the stream's capacity. The supportive breeding scenario assumed the proportion of NORs spawning in the wild was 41-50%; wild productivity was low; the program has been going for less than 4 generations; hatchery environment was semi-natural; less than 10% of the brood stock was hatchery origin; and hatchery production was more than 20% of the stream's capacity.